

WHAT IS CLAIMED IS:

- 1 1. A gas for removing a deposit by a gas-solid reaction, said
2 gas comprising a hypofluorite.
- 1 2. A gas according to claim 1, wherein said hypofluorite is
2 defined as being a compound having at least one OF group in
3 the molecule and optionally having at least one selected from
4 the group consisting of halogen atoms, ether groups, alcohol
5 groups, carbonyl groups, carboxyl groups, ester groups, amine
6 groups, and amide groups.
- 1 3. A gas according to claim 2, wherein said hypofluorite is
2 selected from the group consisting of CF_3OF , $\text{CF}_2(\text{OF})_2$,
3 $\text{CF}_3\text{CF}_2\text{OF}$, CH_3COOF , $(\text{CF}_3)_3\text{COF}$, $\text{CF}_2\text{HCF}_2\text{OF}$,
4 $(\text{CF}_3\text{CF}_2)(\text{CF}_3)_2\text{COF}$, CH_3OF , CFH_2OF , CF_2HOF , $\text{CF}_3\text{CF}_2\text{CF}_2\text{OF}$,
5 and $(\text{CF}_3)_2\text{CFOF}$.
- 1 4. A gas according to claim 1, further comprising an inert
2 gas.
- 1 5. A gas according to claim 1, wherein said deposit is
2 selected from the group consisting of B, P, W, Si, Ti, V, Nb, Ta,
3 Se, Te, Mo, Re, Os, Ru, Ir, Sb, Ge, Au, Ag, As and Cr, and oxides,
4 nitrides, carbides and alloys of these elements.
- 1 6. A gas according to claim 1, wherein said gas is a cleaning
2 gas for substantially completely removing said deposit, said
3 cleaning gas comprising 1-100 volume % of said hypofluorite.
- 1 7. A gas according to claim 6, wherein said cleaning gas
2 further comprises at least one gas component selected from the
3 group consisting of oxygen and oxygen-containing gases.

1 8. A gas according to claim 7, wherein said at least one gas
2 component is in an amount from 0.4 to 90 volume %, based on a
3 total volume of said at least one gas component and said
4 hypofluorite.

1 9. A gas according to claim 7, wherein said oxygen-
2 containing gases are CO₂, CO, NO, NO₂, and N₂O.

1 10. A gas according to claim 6, wherein said cleaning gas has
2 a temperature from 10 to 700°C.

1 11. A gas according to claim 6, wherein said cleaning gas has
2 a first pressure from 0.1 to 760 Torr, when said cleaning gas is
3 used in a plasma-less cleaning, or a second pressure from 1
4 mTorr to 10 Torr, when said cleaning gas is used in a plasma-
5 assisted cleaning.

1 12. A gas according to claim 1, wherein said gas is an
2 etching gas for removing an unwanted portion of said deposit.

1 13. A gas according to claim 12, wherein said etching gas
2 further comprises at least one first gas component selected from
3 the group consisting of hydrogen and hydrogen-containing
4 gases.

1 14. A gas according to claim 13, wherein said hydrogen-
2 containing gases are CH₄, NH₃, HI, HBr, C₂H₂, and HCl.

1 15. A gas according to claim 13, wherein a ratio by volume of
2 said hypofluorite to said at least one first gas component is at
3 least 1:10.

1 16. A gas according to claim 12, said etching gas further
2 comprises at least one second gas component selected from the
3 group consisting of oxygen and oxygen-containing gases.

1 17. A gas according to claim 16, wherein said oxygen-
2 containing gases are CO, NO, N₂O, and NO₂.

1 18. A gas according to claim 16, wherein a volume ratio of
2 said hypofluorite to said at least one second gas component is at
3 least 1:4.

1 19. A gas according to claim 12, wherein said gas has a
2 pressure from 0.001 Torr to 5 Torr.

1 20. A gas according to claim 12, wherein said gas has a
2 temperature of not higher than 400°C.

1 21. A method for removing a deposit by a gas, said method
2 comprising the step of:

3 (a) bringing said gas into contact with said deposit,
4 thereby to remove said deposit by a gas-solid reaction,
5 wherein said gas comprises a hypofluorite.

1 22. A method according to claim 21, wherein said gas is a
2 cleaning gas for substantially completely removing said deposit,
3 and said cleaning gas comprises 1-100 volume % of said
4 hypofluorite.

1 23. A method according to claim 22, wherein said cleaning
2 gas further comprises at least one gas component selected from
3 the group consisting of oxygen and oxygen-containing gases.

1 24. A method according to claim 23, wherein said at least
2 one gas component is in an amount from 0.4 to 90 volume %,
3 based on a total volume of said at least one gas component and
4 said hypofluorite.

1 25. A method according to claim 23, wherein oxygen-
2 containing gases are CO_2 , CO, NO, NO_2 , and N_2O .

1 26. A method according to claim 22, wherein the step (a) is
2 conducted at a temperature from 10 to 700°C.

1 27. A method according to claim 22, wherein the step (a) is
2 conducted under a first pressure from 0.1 to 760 Torr in a
3 plasma-less cleaning or a second pressure from 1 mTorr to 10
4 Torr in a plasma-assisted cleaning.

1 28. A method according to claim 21, wherein said gas is an
2 etching gas for removing an unwanted portion of said deposit.

1 29. A method according to claim 28, wherein said etching
2 gas further comprises at least one first gas component selected
3 from the group consisting of hydrogen and hydrogen-containing
4 gases.

1 30. A method according to claim 29, wherein said hydrogen-
2 containing gases are CH_4 , NH_3 , HI, HBr, C_2H_2 , and HCl.

1 31. A method according to claim 29, wherein the step (a) is
2 conducted under a condition that a flow rate ratio of said
3 hypofluorite to said at least one first gas component is adjusted
4 to be at least 1:10.

1 32. A method according to claim 28, said etching gas further
2 comprises at least one second gas component selected from the
3 group consisting of oxygen and oxygen-containing gases.

1 33. A method according to claim 32, wherein said oxygen-
2 containing gases are CO, NO, N₂O, and NO₂.

1 34. A method according to claim 32, wherein the step (a) is
2 conducted under a condition that a flow rate ratio of said
3 hypofluorite to said at least one second gas component is
4 adjusted to be at least 1:4.

1 35. A method according to claim 28, wherein the step (a) is
2 conducted under a pressure from 0.001 Torr to 5 Torr.

1 36. A method according to claim 28, wherein the step (a) is
2 conducted at a temperature of not higher than 400°C.

1 37. A method according to claim 28, wherein a flow rate of
2 said etching gas in the step (a) is from 10 to 10,000 standard
3 cubic centimeters per minute.